SIGLENT
SIGLENT TECHNOLOGIES

SPO
Super Phosphor Oscilloscope

Quick Start

SDS2000 Series
Digital Oscilloscope

QS01020-E02A

Copyright Information

SIGLENT TECHNOLOGIES CO., LTD. All Rights Reserved.

Declaration

SIGLENT products are protected by patent law in and outside of P.R.C.
SIGLENT reserves the right to modify or change parts of or all the specifications or pricing policies at company's sole decision.
Information in this publication replaces all previously corresponding material.
Any way of copying, extracting or translating the contents of this manual is not allowed without the permission of **SIGLENT**.

Note: **SIGLENT** is the registered trademark of SIGLENT TECHNOLOGIES CO., LTD.

Contact us

SIGLENT TECHNOLOGIES CO., LTD.
Address: 3/F, building NO.4, Antongda Industrial Zone, 3rd Liuxian Road, Bao'an District, Shenzhen, P.R.C.
Tel:+86-755-36615186
E-mail:sales@siglent.com
Http://www.siglent.com

SIGLENT

General Safety Summary

Carefully read the following safety precautions to avoid any personal injury or damage to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

Use Proper Power Line
Only the power cord designed for the instrument and authorized by local country could be used.

Ground the Instrument
The instrument is grounded through the protective earth conductor of the power line. To avoid electric shock, please make sure the instrument is grounded correctly before connecting its input or output terminals.

Connect the Signal Wire Correctly
The potential of the signal wire is equal to the earth, so do not connect the signal wire to a high voltage.

Look Over All Terminals' Ratings
To avoid fire or electric shock, please look over all ratings and sign instruction of the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Use Proper Overvoltage Protection
Make sure that no overvoltage(such as that casued by a thunderstorm) can reach the product, or else the operator might expose to danger of electrical shock.

Electrostatic Prevention
Operate in an electrostatic discharge protective area environment to avoid damages induced by static discharge. Always ground both the internal and external conductors of the cable to release static before connecting.

Keep Well Ventilation
inadequate ventilation may cause increasing of temperature, which will eventually damage the instrument. So keep well ventilation and inspect the intake and fan regularly.

Avoid Circuit or Components Exposed
Do not touch exposed contacts or components when the power is on.

Use Only the Specified Fuse.

Do Not Operate Without Covers
Do not operate the instrument with covers or panels removed.

Safety Terms and Symbols

Terms on the product. These terms may appear on the product:

DANGER Indicates direct injuries or hazards that may happen.

WARNING Indicates potential injuries or hazards that may happen.

CAUTION Indicates potential damages to the instrument or other property that may happen.

Symbols on the product. These symbols may appear on the product:

Warning | Hazardous Voltage | Protective Earth Ground | Earth Ground | Chassis Ground

General Care and Cleaning

Care

Do not store or leave the instrument in direct sunshine for long periods of time.

Notice:

- To avoid damages to the instrument or probe, please do not leave them in fog, liquid, or solvent.

Cleaning

Please perform the following steps to clean the instrument and probe regularly according to its operating conditions.

1. Disconnect the instrument from all power sources, and then clean it with a soft wet cloth.
2. Clean the loose dust on the outside of the instrument and probe with a soft cloth. When cleaning the LCD, take care to avoid scarifying it.

Notice:

- To avoid damages to the surface of the instrument and probe, please do not use any corrosive liquid or chemical cleanser.
- Make sure that the instrument is completely dry before restarting it to avoid short circuits or personal injuries.

Contents

General Safety Summary I
Safety Terms and Symbols II
General Care and Cleaning II

1 Quick start

General Inspection 1
Appearance and Dimension 1
Adjust the Supporting Legs 2
Connect to AC Power Supply 2
Power-on Inspection 3
Connect the Probe 3
Function Inspection 3
Probe Compensation 4
The Front Panel 5
The Rear Panel 6
Introduction of Front Panel 7
Horizontal Control 7
Trigger Control 7
Vertical Control 11

Run Control 13
Universal Knob 14
Function Menus 14
User Interface 16
Using Security Lock 18
2 Troubleshooting **18**

Quick start

General Inspection

1. Inspect the shipping container

Keep the damaged shipping container or cushioning material until the contents of the shipment have been completely checked and the instrument has passed both electrical and mechanical tests.

The consigner or carrier will be responsible for damages to the instrument resulting from shipment. **SIGLENT** would not provide free maintenance or replacement.

2. Inspect the instrument

If there are instruments found damaged, defective or failure in electrical and mechanical tests, please contact **SIGLENT**.

3. Check the accessories

Please check the accessories according to the packing list. If the accessories are incomplete or damaged, please contact your **SIGLENT** sales representative.

Appearance and Dimension

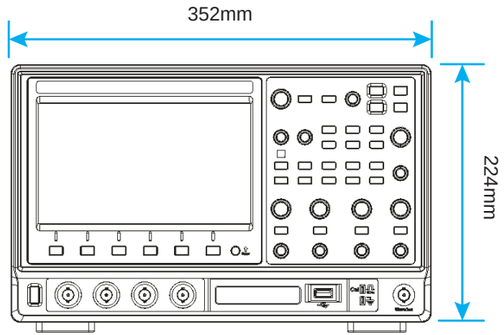


Figure 1 Front View

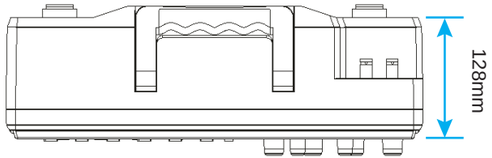
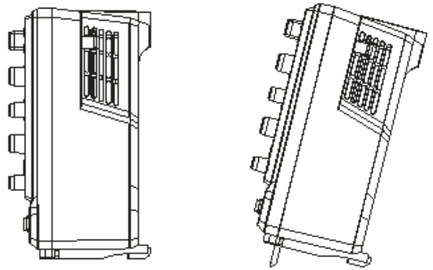


Figure 2 TopView

Adjust the Supporting Legs

Adjust the supporting legs properly to use them as stands to tilt the oscilloscope upwards for stable placement as well as easier operation and observation of the instrument.

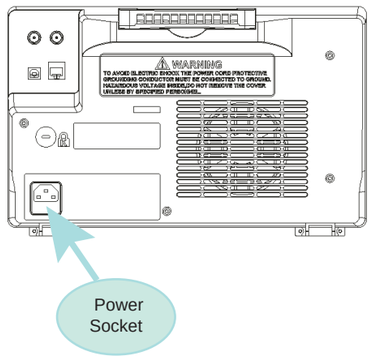


Before adjusting

After adjusting

Connect to AC Power Supply

The oscilloscope accept 100-240V, 45-440Hz AC power supply. Please use the power cord provided as accessories to connect the instrument to the power source as shown in the figure below.



Note: In want of replacing the fuse, please return the instrument to the factory that produced it to have it repaired by qualified service personnel authorized by SIGLENT.

Power-on Inspection

When the scope is energized, turn on the power switch at the lower left corner on the front panel. During the start-up process, the instrument performs a series of self-test items and you can hear the sound of relay switching. After the self-test completed, the User Interface displays immediately.

Connect the Probe

SIGLENT provides passive probe for the SDS2000 series oscilloscope. Please refer to corresponding Probe User Manual for detailed technical information.

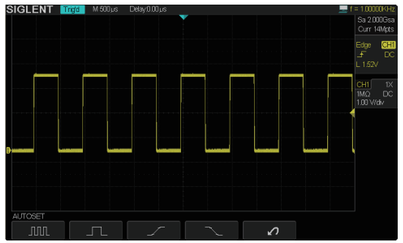
Connect the probe:

1. Connect the BNC terminal of the probe to one of the channel BNC connector of the front panel.
2. Connect the probe tip to the circuit point to test and the ground alligator clip of the probe to the ground terminal of the circuit.

Function Inspection

1. Press Default to restore the oscilloscope to its default setup.
2. Connect the ground alligator clip of the probe to the Ground Terminal on the front panel.

3. Use the probe to connect the CH1 Input Terminal and the Compensation Signal Output Terminal on the front panel.
4. Press Auto Setup
5. Observe the waveform on the screen. In normal condition, the display should be a square waveform as shown in the below:



6. Test the other channels in the same method. If the actual square waveforms does not match that in the figure above, please perform “Probe Compensation”.

Note: To avoid electric shock when using the probe, please firstly make sure that the insulated wire of the probe is in good condition, and do not touch the metallic part of the probe when it is connected to a high voltage.

Probe Compensation

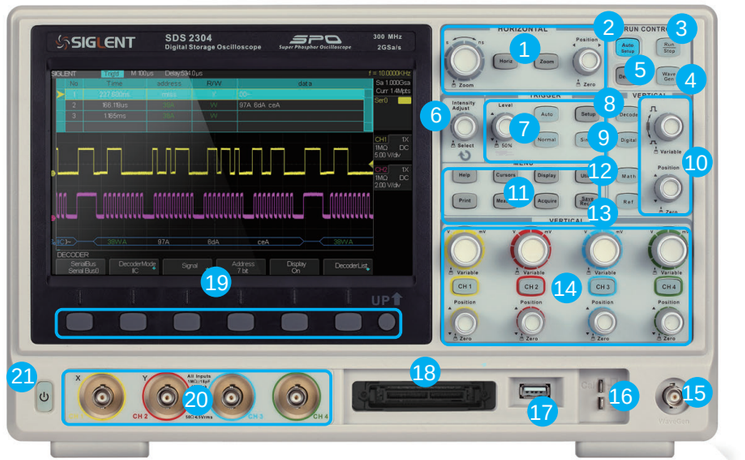
You should properly compensate the probe at first use of it. Non-compensated or inadequate compensated probe may cause inaccurate measurement. The following steps are about probe compensation:

1. Perform step 1, 2 , 3 and 4 of “Function Inspection”.
2. Check the displayed waveforms and compare them with the following figure.

Under Compensated | Compensated Correctly | Over Compensated

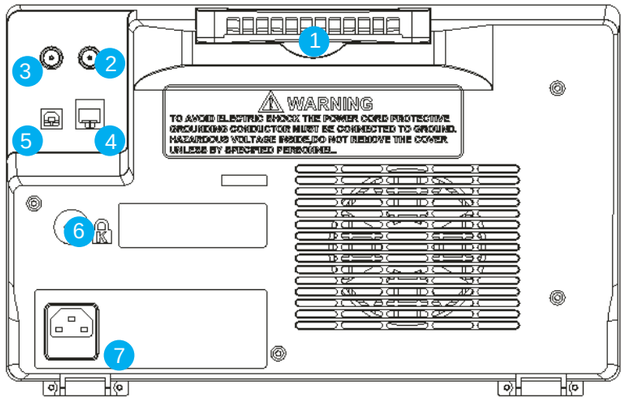
3. Use a nonmetallic driver to adjust the low-frequency compensation adjustment hole on the probe until the waveform changes to be correct as the figure above.

The Front Panel



1. Horizontal Control
2. Auto Setup
3. Run/Stop
4. WaveGen
5. Default Setup
6. Universal Knob
7. Trigger Control
8. Decode Control
9. Digital Channel Control
10. MATH/Ref Vertical Control
11. Function Menus
12. MATH Function
13. Ref
14. Channel Vertical Control
15. WaveGen Output
16. Probe Compensation/Ground Terminal
17. USB Host
18. Digital Channel Inputs
19. Function Menu Softkeys
20. Analog Inputs
21. Power On/Off

The Rear Panel



1. Handle

Pull up the handle vertically for easy carrying; press it down if you do not need the handle.

2. EXT TRIG Connector

3. Pass/Fail or Trig Out Output

Via this interface the oscilloscope can output a signal that can reflect the current capture rate of the instrument at each trigger or a Pass/Fail pulse.

4. LAN Interface

The instrument can be connected to network via this interface to perform remote control.

5. USB Device

PictBridge printer or PC can be connected via this interface to print the current interface of the oscilloscope or control the instrument through PC software.

6. Lock Hole

You could lock the instrument in a fixed location using a security lock (please buy it yourself) via the lock hole.

7. AC Power Socket

The standard power supply for the instrument is 100~240V, 45~440Hz. Please use the power cord provided as accessories to connect the instrument to AC power.

Front Panel Function Brief

Horizontal Control

Horiz : Press the button to open waveform display mode menu. The selectable modes include: X-Y/Y-T/ROLL.

Zoom : Press the button to open delay sweep function. Press again to turn it off.

Horizontal **POSITION** : Modify the trigger position. The waveform will move left or right when you revolve the knob. Meanwhile, the Delay value will also increase or decrease as the the waveform moves. Press down the knob to return the waveform to horizontal center of the screen.

Horizontal **Time Base** : Modify the horizontal time base.Turn it clockwise or counterclockwise to reduce or increase the time base. The waveform will display expanded or compressed and the time base message at the upper left of the screen will change as the time base changes.

Trigger Control

Setup : Press the button to open trigger menu. This oscilloscope provides various trigger types: Edge, Slope, Pulse, Video, Window,Interval, DropOut, Runt, Pattern and Serial Bus（I2C/SPI/UART/RS232/CAN/LIN）.

We will introduce Video, Interval, Runt, Pattern and Serial Bus trigger in the following.

HDTV Video Trig ger

Analog video signal includes NTSC and PAL and HDTV signal are supported in SDS2000 oscilloscopes. In video operation, you can select Custom to set any line and field.

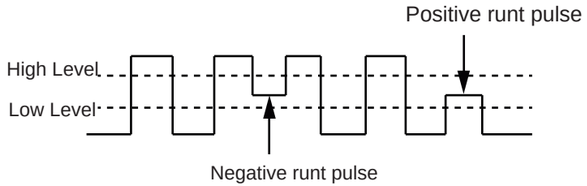
Interval Trigger

The time interval from the rising edge (or falling edge) of input signal passes through the trigger level to the next rising edge(or falling edge) passes through the trigger level and the currently set time satisfy the Limit Range （<, >, < >, > <）selected.

In the figure below, the time interval between two continuous rising edge and the currently set time satisfy the limit range (< >).

Runt Trigger

Runt trigger includes positive runt trigger and negative runt trigger.This trigger mode is used to trigger pulses that pass through one trigger level but fails to pass through the other trigger level as shown in the figure below.

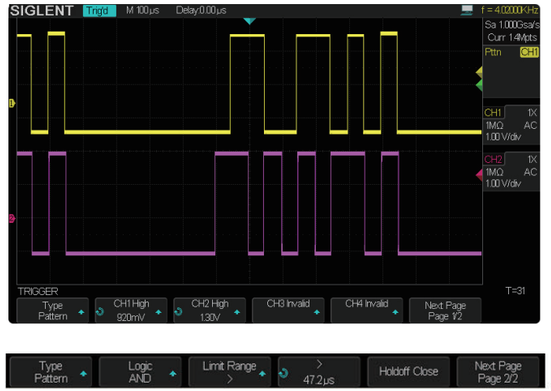


In the figure below, the trigger signal are positive runt pulse.

Pattern Trigger

Identify a trigger condition by looking for a specified pattern. This pattern is a logical combination (AND/OR/NAND/NOR) of the two channels. Each channel can be set a value among High, Low or Invalid.

In the figure below, the selected logic is “AND”, both channel 1 and 2 are set “High”.



I2C Trigger

After setting the serial 1 or 2 to I2C type in trigger menu, you can use universal knob to set to trigger on start/stop condition, restart, no ack,EEPROM, or on the read/write frame with specific device address and data value. During I2C trigger settings, it is essential to set source channel previously in decode menu.

In the figure below,the trigger condition is set to “start”, channel 1 is set as Data signal, channel 2 is set as Clock signal.

SPI Trigger

After setting the serial trigger to SPI type in trigger menu, you can select to trigger on MISO data or MOSI data. The data length are variable to set from 4 to 96.

UART/RS232 Trigger

After setting the serial trigger to UART/RS232 type in trigger menu, you can select to trigger on start , stop, checksum error or data. The data width are variable to set from 5 to 8bits.

CAN Trigger

After setting the serial trigger to CAN type in trigger menu, you can select to trigger on start, remote, ID, ID+DATA or Error of CAN-H or CAN-L signal.

LIN Trigger

After setting the serial trigger to LIN type in trigger menu, you can select to trigger on Start, ID, ID+DATA or Data+Error.

Notes: for more trigger types and corresponding operation information, please refer to the trigger chapter of SDS2000 User Manual.

Normal : Press the button to set to Normal trigger mode.

Auto : Press the button to set to Auto trigger mode.

Single : Press the button to set to Single trigger mode.

Level : Modify the trigger level. Turn it clockwise or counterclockwise to make the level move up or down. In the meanwhile, the level value displayed at the upper right of the screen will increase or decrease. Press it down to quickly reset the trigger level to the vertical center of corresponding waveforms.

Vertical Control

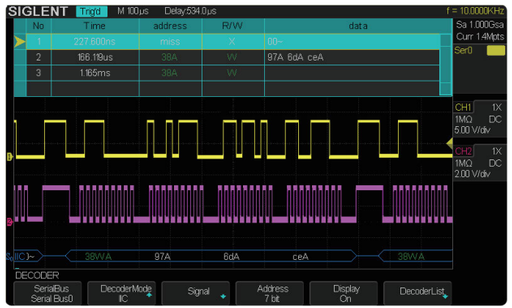
CH 1 : Analog input channels. The four channels are marked by different colors which are also used to mark both the waveforms on the screen and the channel input connectors. Press channel button to open the corresponding channel and press again to turn it off.

Vertical **POSITION** : Modify the vertical position of current waveform. Turn clockwise to increase the position while turn counterclockwise to decrease. During the modification, the waveform will move up and down and the position message at the lower part of the screen will change along. Press down the knob to quickly reset the vertical position to zero.

Vertical Scale : Modify the vertical scale of current waveform. Turn clockwise to decrease the scale while turn counterclockwise to increase it. During the modification, the amplitude of the waveform will enlarge or reduce and the scale message at the right side of the screen will also change. Press down the knob to quickly switch the vertical scale adjustment modes between “Coarse” and “Fine”.

Decode : Decoding function button. Press it to open decode menu. SDS2000 supports two serial buses including 1 and 2 for analog signal (CH1/CH2/CH3/CH4) decoding. The protocols includes I2C, SPI, UART/RS232, CAN and LIN.

Decoding for I2C signal of 7 address is described in the following figure.



Digital : Digital channel function button. Press the button to open digital channel menu. SDS2000 supports 8 integrated digital channels.

Math : Press the button to open math operation menu under which the operation of adding, subtracting, multiplying, dividing, FFT, integral, differential and sqare are supported.

Ref : Press the button to enable the reference waveform function, thus to compare the current waveform with the reference waveform to decide circuit failures. SDS2000 supports 4 reference waveforms saving.

Vertical **POSITION** : Modify the vertical position of Math/Ref waveform. Turn clockwise to increase the position while turn counterclockwise to decrease. During the modification, the waveform will move up and down and the position message at the lower part of the screen will change along. Press down the knob to quickly reset the vertical position to zero.

Vertical Scale : Modify the vertical scale of Math/Ref waveform. Turn clockwise to decrease the scale while turn counterclockwise to increase it. During the modification, the amplitude of the waveform will enlarge or reduce and the scale message at the middle of the screen will also change. In addition, the knob can be used to select a digital channel.

Run Control

Auto Setup : Press the button to enable the waveform auto setting function. The oscilloscope will automatically adjust the horizontal time base, vertical scale and trigger mode according to the input signal to make the waveform displays in a perfect state.

Run Stop : Press the button to set the state of the instrument to “RUN” or “STOP”.

In “RUN”state, the indicator light displays yellow;

In “STOP”state, it displays red.

Default Press the button to reset the oscilloscope to its default setup. The default voltage scale and timebase are respectively 1V/div and 1us/div.

Wave Gen : Press the button to open the WaveGen menu. SDS2000 provides built-in signal generator function. Ten types of signal including Sine, Square, Ramp, Pulse, DC, Noise, Cardiac, Gaus Pulse, Exp Rise and Exp Fall are supported.The most output frequency is 25MHz
In addition, the insrtument can output any waveforms by connecting EasyWave software through remote conrtol.

Universal Knob

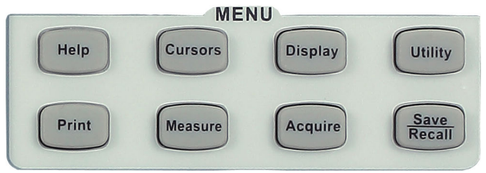
Adjust Waveform Intensity/Grid Brightness/Transpanrency

In non-menu-operation mode, (menu is hidden),turn this knob to adjust waveform intensity (0% ~ 100%). Turn clockwise to increase the brightness and counterclockwise to reduce. You can also press **Display** → **Intensity** and use the knob to do adjusting. To adjust grid brightness (0% ~ 100%） or transparency(20% ~ 80%）,please operate in the same way as waveform intensity.

Universal Knob:

In menu operation,when the light below the knob is lighted, you could revolve the knob to select between submenus under the current menu and press it down to select the current submenu. In addition, it can also be used to modify parameters and input filename.

Function Menus



Cursors : Press the button to enter the cursor measurement menu. The instrument provides Time and Voltage measure.

Display : Press the button to enter the display menu to set waveform Type, Color, Persist , Clear Display, Grid, Intensity, Brightness and Transperancy.Transperancy indicates the display transperancy of any popup messagebox. For instance, you could use universal knob to adjust transperancy of the messagebox when Cursor Measurement is on.

Utility : Press the button to enter the utility menu to set system-related functions or parameters, such as IO Set, Sound, language. In addition, some advanced functions (such as Pass/Fail test, Print Setup, Do Self Test and Update) are also supported.

Help : Press the button to enable HELP function,and then press down any menu to display corresponding help information.To display the submenus help information of the current menu, firstly you should open the current menu, and then press down the “HELP” button, the last step is to select any submenu you want.

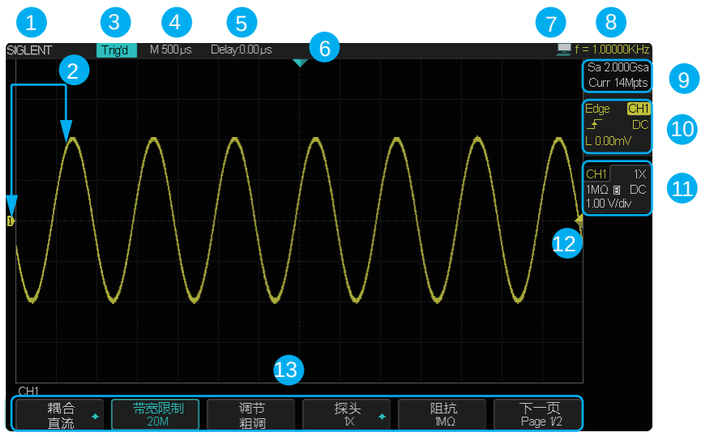
Print : Press the button to enable print function. If the instrument is connected to a printer which is usable, press it to perform print function.

Measure : Press the button to enter the measurement setting menu. You could set measurement setting, statistic function and all measure. In measurement setting, you could select as many as five parameters and display them simultaneously on the screen. In statistic function,the curent value, Mean value, Min value, Max value, Std-Dev and Counts are displayed on the screen. In all measure, you could display all Voltage/Time/Delay parameters by pressing the corresponding softkey.

Acquire : Press the button to enter the sample setting menu to set the acquisition mode (Normal/Peak Detect/ Average/High Res), dot inserting mode and memory depth (7K/14K/70K/140K/700K/1.4M/7M/14M).

Save Recall : Press the button to enter the file save and recall function menu. the storable file types includes Setups, Waveforms, Picture and CSV.

User Interface



5. Trigger Position

Use horizontal **POSITION** knob to modify the parameter. Turn clockwise or counterclockwise to make the waveform move right or left, which will respectively cause the Delay parameter to decrease or increase. Press down the knob to automatically reset the parameter to zero as well as make the waveform return to horizontal center of the screen.

1. Product Logo

SIGLENT is the registered trademark of our company.

2. Channel Label/Waveform

Different channels are marked by different colors and the color of the waveform complies with the color of the channel.

3. Working state

Available states include Arm、Ready、Trig'd、Stop、Auto.

4. Horizontal Time Base

Represent the time of each grid on the horizontal axis of the screen. You could revolve to modify the parameter which is variable from1ns ~ 50s.

6. Trigger position

Display the trigger position of the waveform on the screen.

7. USB Device Interface Mark

Indicate the current set of USB Device Interface. If the icon displays , the interface is set to USBTMC, if the icon display , the interface is set to Printer.

8. Frequency Counter

Display the firmware frequency of current waveform.

9. Sample Rate/Memory Depth

Display the current sample rate and memory depth of the oscilloscope. Use horizontal SCALE knobe to modify the parameter.

10. Trigger Setting

Trigger Source CH1 Display the trigger source currently selected. Different labels are displayed when different trigger source are selected and the color of the trigger parameter area will change accordingly.

Coupling Mode DC Display coupling mode (DC/AC/LF Reject/HF Reject) of the current trigger source.

Trigger Level L 0.00mV Display the trigger level value of the current waveform. Press down the knob to reset the parameter to zero.

Trigger Type Edge Display the currently selected trigger type and trigger condition setting. Different labels are displayed when different trigger types are selected.

For example: means triggered on Slop side in edge trigger.

11. Channel Setting

Probe Attenuation Factor 1X Display currently selected probe attenuation factor.All factors are: 1X/5X/10X/50X /100X/500X/1000X.

Channel Coupling DC Display the selected coupling mode of the current channel.All modes are: DC/AC/GND.

Voltage Scale 1.00V/div Represent the voltage value of each grid on the vertical axis of the screen.Use POSITION knobe to modify the parameter which is variable from

BW Limit B If the current "BW Limit" is "On", then the mark B displays. When the vertical scale is 2mV/div, the "BW Limit" turns on automatically.

Impedance 1MΩ Display currently selected impedance(1MΩ/50Ω) of the channel.

12. Trigger Level Position

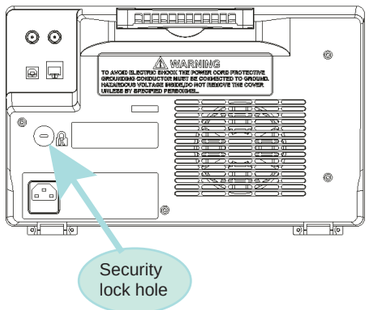
Display position of the current channel trigger level. Press down the konb to reset the level to vertical center of the screen.

13. Menu

Display menus of the currently selected function module. Press any menu softkey to perform corresponding setting.

Using Security Lock

If needed, you could use the security lock (please buy it yourself) to lock the instrument in a fixed location. The method: align the clock with the clock hole and plug it into the lock hole vertically, turn the key clockwise to lock the instrument and then pull the key out.



Troubleshooting

The general failures and consequential solutions are listed below. When you find them, please deal with them in the following corresponding ways. If the problem proves to be unsolvable by yourself, please contact with **SIGLENT** as soon as possible.

1. The screen remains dark after power on:

（1）Check if the power is correctly connected.
（2）Check if the power switch is faulted.
（3）Check whether the fuse is burned out. If the fuse needs to be changed, please contact with **SIGLENT** as soon as possible and return the instrument to the factory to have it repaired by qualified personnel authorized by **SIGLENT.**
（4）Restart the instrument after completing inspections above.
（5）If it still does not work normally, please contact **SIGLENT.**

2. After the signal is sampled, there is no corresponding waveform displaying:

（1）Check if the probe is correctly connected to the signalconnecting cord.

（2）Check if the signal connecting cord is correctly connected to BNC.
（3）Check if the probe is correctly connected to the item under test.
（4）Check if there are signal generated from the item under test.
（5）Resample the signal.

3. The voltage amplitude measured is higher or lower than the actual value (the error usually occurs in use of the probe):

Check if the attenuation coefficient of the current channel matches with the attenuation ratio of the probe.

4. There is waveform displaying but not stable:

（1）Check the trigger source: check whether the “Source” in menu of “TRIG” is the actual operating channel.
（2）Check if the waveform is wrong: it is easy for us to regard the wrong waveform as the real when a high frequency signal is connected to the instrument. You’d better make sure that the current time base is correct.
（3）Check the trigger type: “Edge” trigger suits to general signal and “Video” trigger suits to video signal. Only in correct trigger type can the waveform stably displays.
（4）Change the setting of trigger holdoff.

5. No display after pressing

:

Check whether the trigger Mode is “Normal” or “Single”, and if the trigger level exceeds the waveform range. If yes, set the trigger level to the middle or change the trigger Mode to “Auto”.

Note: press “Auto Scale” could automatically replace the above setting.

6. The waveform displays like ladder:

（1）The horizontal time base may be too low, you can increase it to improve the horizontal resolution so as to make a good waveform displaying.
（2）The lines between the sample points may also cause ladder-like displaying if the “Type” in menu of “DISPLAY” is “Vectors”. Please turn the “Type” to “Dots” to solve the problem.

7. USB storage can’t be recognized:

（1）Check if the USB flash disk can work normally.
（2）Check if the USB Device Host can work normally.
（3）Make sure the USB disk being used is of flash type, the instrument does not support USB of hardware type.
（4）Make sure the system format of used USB disk is FAT32.
（5）Restart the instrument and then insert the USB to check it.
（6）If it is still in abnormal use, please contact with **SIGLENT**.